Sudbury Neutrino Observatory Prompt Off-line Monitoring and Analysis

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It is often desirable to execute some immediate processing of the data arriving from the detector to get a picture of its general health and stability. One hopes that the detector will operate in a stable manner throughout its lifetime. However, changes in performance will most certainly occur, and must be corrected in the hardware or accounted for in the data analysis. These changes can be either sudden or gradual, so a monitoring system which includes both a prompt analysis and archive history are needed. These requirements are accomplished by taking "snapshots" of the detector which can be quickly compared.

In order to spot sudden changes in the detector, we need to process the data quickly. For this stage, a full analysis of the raw data is not necessary, and the production of some simple, low–level tables and histograms are sufficient. At the moment, items which are being examined in this process includes the detector configuration, total event rate, rates of different triggers, and rates of triggers from each PMT. Upon receipt of a data tape, a process (the SNO Run Examination — SNORE) is started which automatically runs through all of the data files and produces the necessary statistics for each file. A typical data tape covers a few weeks' worth of operation, and each data file represents a few hours worth of data.

The output of the SNORE process is a set of files (tables, pictures and HBOOK files) which are linked together with an HTML interface for access via web browsers. A search interface has also been developed to allow a user to find a particular set of data.

While the raw data file is being examined by the SNORE processor, it is passed through a "first–pass" processor (FPP), which has been developed here at Berkeley. The function of this processor is to remove unphysical backgrounds in the data before applying the event reconstruction, which is computationally intensive. One type of such backgrounds is the "orphans", which are problematic events identified by the event builder. Electronic noise would cause the detector to re–trigger immediately after the previous trigger. These re–triggers are removed by the FPP. The SNO photomultiplier tubes are known to emit light intermittently ("flashers"). These flashers show distinct signatures in the SNO electronic system, and can be removed easily by the FPP. If the detector is shown to be running in a stable manner by the SNORE processor, the Pulsed Global Trigger (PGT) events are also removed from the raw data. The PGT events are triggered by a pulser at regular time interval, thereby taking snap–shots of the detector. These events are important to understanding the running behavior of the detector, but are backgrounds in the energy spectrum.

Additional tools have been developed to access the results of these processes to pass information about the detector configuration and operation back into the analyses. One such tool, the SNORE Histogram Accumulation Generator, allows users to select runs based on the several criteria and sum together their histogram results. This allows us to easily select data collected under similar operating conditions and see the detectors behavior over longer time scales. This ability is currently being used to choose the data to be analyzed for solar neutrinos.